

capillary that has a chamfer angle of not greater than 100° when a gold ball is formed by an electric spark at a tip of a gold wire similarly to the wire bonding in forming the bump on the electronic component and a tip shape provided with no flat portion to be brought in contact with the gold ball.

According to a 31st aspect of the present invention, there is provided an electronic component mounting method comprising:

forming a ball at a tip of a metal wire by an electric spark similarly to wire bonding and forming a bump on an electrode of an electronic component by means of a capillary by the formed ball;

mounting the electronic component on a circuit board while aligning in position the electrode of the electronic component with an electrode of the board with interposition of a solid or semi-solid insulating resin layer in which an insulating resin is mixed with an inorganic filler without leveling the formed bump;

subsequently hardening the insulating resin interposed between the electronic component and the circuit board while correcting warp of the board with a pressure P_1 applied as a pressure force to the electronic component against the circuit board and heat applied from an upper surface of the electronic component by means of a tool

heated to a specified temperature; and

subsequently bonding the electronic component to the circuit board while alleviating a stress caused when hardening the insulating resin by reducing the pressure force to a pressure P2 lower than the pressure P1 after a lapse of a specified time, so that the electrode of the electronic component is electrically connected with the electrode of the circuit board.

According to a 32nd aspect of the present invention, there is provided an electronic component mounting method as defined in the 31st aspect, wherein the pressure P1 is not smaller than 20 gf per bump, and the pressure P2 is not greater than one-half the pressure P1.

According to a 33rd aspect of the present invention, there is provided an electronic component mounting apparatus comprising:

a device for sticking a solid or semi-solid insulating resin layer, in which an insulating resin is mixed with an inorganic filler, to an electrode of a circuit board or an electronic component;

a device for forming a bump, without leveling, by forming a ball by an electric spark at a tip of a metal wire on an electrode of the electronic component similarly to wire bonding and forming by thermocompression-bonding this to the electrode of the board with supersonic waves by

means of a capillary;

a device for mounting the electronic component on the electrode of the circuit board through positional alignment; and

5 a device for bonding the electronic component to the circuit board by hardening the insulating resin interposed between the electronic component and the circuit board while correcting warp of the board with a pressure force of not smaller than 20 gf per bump applied to the
10 electronic component against the circuit board with heating by means of the tool, electrically connecting the electrode of the electronic component with the electrode of the circuit board.

According to a 34th aspect of the present
15 invention, there is provided an electronic component mounting apparatus comprising:

a device for sticking a solid or semi-solid insulating resin layer, in which an insulating resin is mixed with an inorganic filler, to an electrode of a
20 circuit board or an electronic component;

a device for forming a gold bump, without leveling, by forming a ball by an electric spark at a tip of a metal wire on an electrode of the electronic component similarly to wire bonding and forming by thermocompression-
25 bonding this to the electrode of the board with supersonic